

WHAT IS CLAIMED IS

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1. An information reproduction method for reproducing contents of an information recording medium that has at least one data zone for storing data, comprising:

10 a non-recorded zone determination step for determining whether the entirety of a reproduction zone is a recorded zone wherein data are stored, or whether at least a part of the reproduction zone is a non-recorded zone wherein no data are stored at a
15 predetermined timing when or after a request for reproduction (reproduction request) is received, the reproduction zone having contents which are requested to be reproduced by the reproduction request, and being included in the data zone of the
20 information recording medium.

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2. The information reproduction method as

claimed in claim 1, wherein the predetermined timing is set at a point in time when the reproduction request is received.

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3. The reproduction method as claimed in claim 2, further comprising:

10 an error processing step for outputting error information without reproducing the non-recorded zone when the non-recorded zone is determined to be present in the reproduction zone at the non-recorded zone determination step.

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4. The reproduction method as claimed in
20 claim 1, wherein the predetermined timing is set at a point in time when reproduction data are not obtained normally while reproducing the reproduction zone.

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5. The reproduction method as claimed in claim 4, further comprising:

5 an error processing step for outputting error information without retrying reproduction of the non-recorded zone when the non-recorded zone is determined to be present in the reproduction zone at the non-recorded zone determination step.

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6. The reproduction method as claimed in claim 1, further comprising:

15 a boundary determination step for determining whether information about a boundary between the recorded zone and the non-recorded zone has been obtained, the boundary determination step
20 being performed in advance of the non-recorded zone determination step, and the non-recorded zone determination step being performed only when the boundary determination step determines that the information about the boundary has not been obtained.

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7. The reproduction method as claimed in
5 claim 1, further comprising:

a boundary setting step;

wherein a start address of the non-
recorded zone of the reproduction zone is made into
the address of the boundary between the recorded
10 zone and the non-recorded zone when the non-recorded
zone is determined to be present in the reproduction
zone at the non-recorded zone determination step,
and when the start address of the non-recorded zone
differs from the start address of the reproduction
15 zone.

20 8. The reproduction method as claimed in
claim 1, further comprising:

a confirmed non-recorded zone updating
step wherein a start address of a zone that has been
confirmed as a non-recorded zone (confirmed non-
25 recorded zone) is updated if a start address of a

non-recorded zone of the reproduction zone is less than the start address of the confirmed non-recorded zone.

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9. The reproduction method as claimed in claim 8, further comprising:

10 a confirmed non-recorded zone
determination step for determining whether at least a part of the reproduction zone is included in the confirmed non-recorded zone, which step is performed in advance of the non-recorded zone determination
15 step; and

an error setting step for outputting error information without reproducing the zone included in the confirmed non-recorded zone when at least a part of the reproduction zone is determined to be
20 included in the confirmed non-recorded zone at the confirmed non-recorded zone determination step.

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10. The reproduction method as claimed in claim 1, further comprising:

a confirmed recorded zone updating step;
wherein an end address of a zone that has been
5 confirmed as a recorded zone (confirmed recorded zone) is updated if an end address of the reproduction zone, reproduction of which has been normally performed, is greater than the ending address of the confirmed recorded zone.

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11. The reproduction method as claimed in
15 claim 10, further comprising:

a confirmed recorded zone determination step for determining whether the entirety of the reproduction zone is contained in the confirmed recorded zone, the confirmed recorded zone
20 determination step being performed in advance of the non-recorded zone determination step, and the non-recorded zone determination step is performed only when at least a part of the reproduction zone is determined not to be contained in the confirmed
25 recorded zone at the confirmed recorded zone

determination step.

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12. The reproduction method as claimed in claim 1, further comprising:

a confirmed non-recorded zone updating step wherein a start address of a zone that has been confirmed as a non-recorded zone (confirmed non-recorded zone) is updated if the non-recorded zone determination step determines that a non-recorded zone is present in the reproduction zone, and if a start address of the non-recorded zone is less than the start address of the confirmed non-recorded zone;

a confirmed recorded zone updating step wherein an end address of a zone that has been confirmed as a recorded zone (confirmed recorded zone) is updated if an end address of the reproduction zone, reproduction of which has been normally performed, is greater than the ending address of the confirmed recorded zone; and

a boundary defining step that is performed if the start address of the confirmed non-recorded

zone is the same as the end address of the confirmed recorded zone, wherein the address of the boundary of the recorded zone and the non-recorded zone is defined by the same address.

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13. A program for a control computer of a drive apparatus to execute, the drive apparatus being capable of at least reproducing data stored in an information recording medium that has at least one data zone for storing data, which drive apparatus does not have to be, but may also be capable of writing and erasing data, comprising:

15 a read command monitoring step for monitoring a request for reproduction of a zone (reproduction zone) of the data zone of the information recording medium; and

20 a non-recorded zone determination step for determining whether the entirety of the reproduction zone is a recorded-zone wherein data are stored, or at least a part of the reproduction zone is a non-recorded zone wherein no data are stored at a

25 predetermined timing when or after the request for

reproduction (reproduction request) is received.

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14. The program as claimed in claim 13,
wherein the predetermined timing is set at a point
in time when the reproduction request is received.

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15. The program as claimed in claim 14,
further comprising:

15 a step for outputting error information
without reproducing the non-recorded zone when the
non-recorded zone is determined to be present in the
reproduction zone at the non-recorded zone
determination step.

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16. The program as claimed in claim 13,
25 wherein the timing is a point in time when

reproduction data are not obtained normally while reproducing the reproduction zone.

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17. The program as claimed in claim 16, further comprising:

a step for outputting error information
10 without retrying reproduction of the non-recorded zone when the non-recorded zone is determined to be present in the reproduction zone at the non-recorded zone determination step.

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18. The program as claimed in claim 13, further comprising:

20 a boundary determination step for determining whether information about a boundary between the recorded zone and the non-recorded zone has been obtained, the boundary determination step being performed in advance of the non-recorded zone
25 determination step, and the non-recorded zone

determination step being performed only when the boundary determination step determines that the information about the boundary has not been obtained.

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19. The program as claimed in claim 13, further comprising:

10 a boundary setting step for making the start address of the non-recorded zone of the reproduction zone into the address of the boundary between the recorded zone and the non-recorded zone if the non-recorded zone is determined to be present
15 in the reproduction zone at the non-recorded zone determination step, and if the start address of the non-recorded zone differs from the start address of the reproduction zone.

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20. The program as claimed in claim 13, further comprising:

25 a confirmed non-recorded zone updating

step for updating the start address of a zone that
has been confirmed as a non-recorded zone (confirmed
non-recorded zone) if the start address of the non-
recorded zone of the reproduction zone is less than
5 the start address of the confirmed non-recorded zone.

10 21. The program as claimed in claim 20,
further comprising:

 a confirmed non-recorded zone
determination step for determining whether at least
a part of the reproduction zone is included in the
15 confirmed non-recorded zone, which step being
performed in advance of the non-recorded zone
determination step; and

 a step for outputting error information
without reproducing the zone included in the
20 confirmed non-recorded zone when at least a part of
the reproduction zone is determined to be included
in the confirmed non-recorded zone at the confirmed
non-recorded zone determination step.

22. The program as claimed in claim 13,
further comprising:

5 a step for updating an end address of a
zone that has been confirmed as a recorded zone
(confirmed recorded zone) if an end address of the
reproduction zone, reproduction of which has been
normally performed, is greater than the ending
10 address of the confirmed recorded zone.

15 23. The program as claimed in claim 22,
further comprising:

 a confirmed recorded zone determination
step for determining whether the entirety of the
reproduction zone is contained in the confirmed
20 recorded zone, the confirmed recorded zone
determination step being performed in advance of the
non-recorded zone determination step, and the non-
recorded zone determination step is performed only
when at least a part of the reproduction zone is
25 determined not to be contained in the confirmed

recorded zone at the confirmed recorded zone
determination step.

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24. The program as claimed in claim 13,
further comprising:

a confirmed non-recorded zone updating
10 step wherein a start address of a zone that has been
confirmed as a non-recorded zone (confirmed non-
recorded zone) is updated if a start address of a
non-recorded zone of the reproduction zone is less
than the start address of the confirmed non-recorded
15 zone;

a confirmed recorded zone updating step
wherein an end address of a zone that has been
confirmed as a recorded zone (confirmed recorded
zone) is updated if an end address of the
20 reproduction zone, reproduction of which has been
normally performed, is greater than the ending
address of the confirmed recorded zone; and

a boundary defining step that is performed
if the start address of the confirmed non-recorded
25 zone is the same as the end address of the confirmed

recorded zone, wherein the address of the boundary of the recorded zone and the non-recorded zone is defined by the same address.

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25. A computer-readable recording medium wherein the program as claimed in claim 13 is stored.

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26. A drive apparatus capable of at least reproducing data by irradiating a light beam to an information recording medium that has at least one data zone for storing data, which drive apparatus does not have to be, but may also be capable of writing and erasing data, comprising:

20 non-recorded zone determination means for determining whether data are recorded in the entirety of a reproduction zone, contents of which are requested for reproduction (reproduction request), or the reproduction zone contains a non-recorded zone where data are not recorded, the

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reproduction zone being included in the data zone of the information recording medium, and the non-recorded zone determination being carried out at a predetermined timing on or after a point in time

5 when the reproduction request is received;

an optical pickup apparatus for receiving the light irradiated to and reflected from the information recording medium; and

a processing apparatus for at least

10 reproducing data using an output signal of the optical pickup apparatus, which processing apparatus does not have to be, but may also be capable of writing and erasing data.

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27. The drive apparatus as claimed in claim 26, wherein the predetermined timing is set at
20 a point in time when the reproduction request is received.

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28. The drive apparatus as claimed in
claim 27, further comprising:

error setting means for outputting error
information without reproducing the non-recorded
5 zone when the non-recorded zone is determined to be
present in the reproduction zone by the non-recorded
zone determination means.

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29. The drive apparatus as claimed in
claim 26, further comprising:

error monitoring means for monitoring a
15 reproduction error occurring during reproduction
performed by the processing apparatus, and the
predetermined timing is set at a point in time when
a reproduction error is detected by the error
monitoring means.

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30. The drive apparatus as claimed in
25 claim 29, further comprising:

error processing means for outputting
error information without retrying reproduction of
the non-recorded zone when the non-recorded zone is
determined to be present in the reproduction zone by
5 the non-recorded zone determination means.

10 31. The drive apparatus as claimed in
claim 26, further comprising:
boundary determination means for
determining whether the information about the
boundary between the recorded zone where the data in
15 are recorded, and the non-recorded zone where data
are not recorded has been obtained, and the non-
recorded zone determination step is performed by the
non-recorded zone determination means only when the
boundary determination means determines that the
20 information about the boundary has not been obtained.

25 32. The drive apparatus as claimed in

claim 26, further comprising:

boundary setting means for making the
start address of the non-recorded zone of the
reproduction zone into the boundary address between
5 the recorded zone where the data are recorded, and
the non-recorded zone where data are not recorded,
when the non-recorded zone determination means
determines that the non-recorded zone is present in
the reproduction zone, and when the start address of
10 the non-recorded zone differs from the start address
of the reproduction zone in the reproduction zone.

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33. The drive apparatus as claimed in
claim 26, further comprising:

a confirmed non-recorded zone memory unit
for storing information about a data zone that has
20 been confirmed as a non-recorded zone (confirmed
non-recorded zone); and

confirmed non-recorded zone updating means
for updating the information about the confirmed
non-recorded zone stored in the confirmed non-
25 recorded zone memory if the non-recorded zone

determination means determines that the non-recorded zone is present in the reproduction zone, and if the start address of the non-recorded zone of the reproduction zone is less than the start address of the confirmed non-recorded zone stored in the confirmed non-recorded zone memory.

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34. The drive apparatus as claimed in claim 33, further comprising:

confirmed non-recorded zone determination means for determining whether at least a part of the reproduction zone belongs to the confirmed non-recorded zone based on the information about the confirmed non-recorded zone stored in the confirmed non-recorded zone memory; and

error setting means for outputting error information without reproducing the zone that is determined to belong to the confirmed non-recorded zone by the confirmed non-recorded zone determination means.

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35. The drive apparatus as claimed in
claim 33, wherein two or more data zones are formed
5 on the recording surface of the information
recording medium, and the information about the
confirmed non-recorded zone for each data zone is
stored in the confirmed non-recorded zone memory.

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36. The drive apparatus as claimed in
claim 26, further comprising
15 a confirmed recorded zone memory for
storing information about a zone that has been
confirmed as a recorded zone; and
confirmed recorded zone updating means for
updating the information about the confirmed
20 recorded zone stored in the confirmed recorded zone
memory if the ending address of a zone, reproduction
of which is normally performed, of the reproduction
zone is greater than the ending address of the
confirmed recorded zone stored in the confirmed
25 recorded zone memory.

5 37. The drive apparatus as claimed in
claim 36, further comprising:

 confirmed recorded zone determination
means for determining whether the entirety of the
reproduction zones is included in the confirmed
10 recorded zone based on the information about the
confirmed recorded zone stored in confirmed recorded
zone memory, wherein the non-recorded zone
determination step is performed by the non-recorded
zone determination means only when the confirmed
15 recorded zone determination means determines that at
least a part of the reproduction zone is not
included in the confirmed recorded zone.

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 38. The drive apparatus as claimed in
claim 36, wherein two or more data zones are formed
on the recording surface of the information
25 recording medium, and the information about the

confirmed recorded zone for each data zone is stored
in the confirmed recorded zone memory.

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39. The drive apparatus as claimed in
claim 26, further comprising:

a confirmed zone memory for storing
10 address information of the data zone, comprising the
start address of the confirmed non-recorded zone
where it is already confirmed that data are not
recorded, and the ending address of the confirmed
recorded zone where it is already confirmed that
15 data are recorded;

confirmed non-recorded zone updating means
for updating the start address of the confirmed non-
recorded zone stored in the confirmed zone confirmed
zone memory if the non-recorded zone determination
20 means determines that the non-recorded zone is
present in the reproduction zone, and if the start
address of the non-recorded zone of the reproduction
zone is less than the start address of the confirmed
non-recorded zone stored in the confirmed zone
25 memory;

confirmed recorded zone updating means for updating the ending address of the confirmed recorded zone stored in the confirmed zone memory when the ending address of the zone, reproduction of which is normally performed, is greater than the ending address of the confirmed recorded zone stored in the confirmed zone memory; and

boundary defining means for defining the boundary address of the recorded zone where the data in the data zone are recorded, and the non-recorded zone where data are not recorded, if the start address of the confirmed non-recorded zone and the ending address of the confirmed recorded zone are the same, by the same address.

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40. The drive apparatus as claimed in claim 39, wherein two or more data zones are formed on the recording surface of the information recording medium, and the address information of each data zone is stored in the confirmed zone memory.

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41. The drive apparatus as claimed in
5 claim 26, wherein the information recording medium
is capable of storing additional information, but
does not allow rewriting of data.

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42. The drive apparatus as claimed in
claim 41, wherein the information recording medium
is an information recording medium based on the
15 specification of DVD+R.